



CATH DE LITTLE

# THALLIUM

Element Symbol: **Tl**

Atomic Number: **81**

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The soft toxic heavy metal thallium was discovered independently by William Crookes and Claud-Auguste Lamy in 1861. Crookes and Lamy were studying the composition of selenium and tellurium compounds generated as by-products of sulfuric acid production using the then new technique of atomic emission spectroscopy. Serendipitously, both stumbled across the green emission line of thallium. The name thallium derives from the greek thallos meaning green shoot.

As the heaviest element of group 13, thallium exhibits two very stable oxidation states; thallium(III) and thallium(I). The chemistries of both cations may be likened to those of potassium and silver(I), and aluminium respectively.

The natural abundance of thallium in the Earth's crust is 0.70 ppm. It is found in several rare thallium minerals, two of which being crooksite, named after William Crookes, and lorandite. A more practical source of thallium is the smelting of tailings from copper, lead and zinc mining.

Early applications of thallium utilised its toxicity. These include as a rodenticide, an insectide, a treatment for tuberculosis, and in topical creams for skin infections such as ring worm. Pharmaceutical use of thallium was halted almost half a century ago due to its narrow therapeutic index and the development of more advanced medicines. Nonetheless, the tasteless and aroma-less thallium sulfate salt has gained a reputation as a cumulative poison, leading some to use the nickname 'poisoners poison' or 'inheritance powder'.

Today, approximately 70% of thallium production is used in the electronics industry. This includes IR photoresistors containing thallium sulfide, IR radiation detectors and transmission equipment containing thallium bromide, iodide and selenide, and Tl doped sodium iodide gamma radiation scintillation detector equipment. Further applications include the use of thallium oxide in glasses to increase density and refractive index, the use of  $^{201}\text{Tl}$  in cardiac imaging for electron capture and gamma ray imaging, and incorporation into one of the earliest known superconductors, which contained Tl, Ba, Ca, Cu and O.

At this time there is no need to mine thallium as it is generated as a by-product of other mining industries. A major problem associated with this is the environmental thallium pollution caused by leaching of thallium from ore processing, wherein several known salts of thallium(I) are known to be highly water soluble.

*Provided by the element sponsor sponsor Marcus Cole*

## ARTISTS DESCRIPTION

My design for thallium is based on its bright green emission spectrum lines which led to its discovery. The name thallium means 'green shoot'. It is very toxic, but difficult to detect and became known as 'the poisoner's poison'. The partial magnifying glass hints at this.

**CATH DE LITTLE**